

## DOCUMENT RESUME

ED 480 961

CE 085 365

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TITLE Information Technology Workforce Development: Public Policy Review and Discussion.  
INSTITUTION Ohio State Univ., Columbus. Center on Education and Training for Employment.  
PUB DATE 2002-03-10  
NOTE 26p.  
AVAILABLE FROM For full text: <http://www.cete.org/wpapers/pdfdocs/ITWDE-robertkerr.pdf>.  
PUB TYPE Information Analyses (070)  
EDRS PRICE EDRS Price MF01/PC02 Plus Postage.  
DESCRIPTORS \*Demand Occupations; Educational Objectives; Federal Government; Federal Legislation; \*Government Role; Higher Education; Human Capital; \*Information Technology; \*Labor Force Development; Labor Needs; Labor Supply; Local Government; Occupational Clusters; Partnerships in Education; Policy Formation; \*Public Policy; Role of Education; Secondary Education; \*State Government; Technological Advancement  
IDENTIFIERS \*Computer Occupations; Workforce Investment Act 1998

## ABSTRACT

Keeping the existing information technology (IT) workforce viable and rapidly increasing the number of these workers presents a United States public policy workforce development (WD) challenge at all government levels. Public policy human capital investments have been undertaken to address the IT workforce supply and demand mismatch. States seem to be best positioned to be the pivotal public policy creators and implementers in the high-skill, high-tech economy. States' education systems are their primary public policy levers. The National Governors Association's activities show high-tech clusters and ITWD are high on states' public policy debate agendas. The state-managed college/university system supporting ITWD is inadequate to meet IT labor and skills demands. To supplement existing higher education systems, states are pursuing new ITWD public policies. Three significant state ITWD approaches are improving ITWD in their existing state-managed education system; implementing the "cluster" as the new vehicle to support improved ITWD; and dividing major cities into groups to encourage cooperative ITWD efforts. City ITWD efforts are most effective as part of state or federal programs. The fundamental federal role in ITWD has been to monitor and report on IT workforce needs and to facilitate states in dealing with their individual IT workforce needs. National ITWD public policy examples are the American Competitiveness and Workforce Improvement Act and Workforce Investment Act. (Contains 30 references.) (YLB)

Graduate Student Term Paper  
INFORMATION TECHNOLOGY - WORKFORCE DEVELOPMENT  
PUBLIC POLICY REVIEW and DISCUSSION

March 10, 2002

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## INTRODUCTION

### Adult Learning For U.S. Competitive Advantage

It now seems axiomatic that the world is continuing to rapidly change and that the U.S. economy is being called upon regularly to transform itself, in increasingly short time frames, to adapt to the shifting competitive landscape. Work related learning has been identified as a key enabler of effective economic advantage for countries like the U.S. to remain competitive. Marshall and Tucker state that, "The future now belongs to societies that organize themselves for learning." (Marshall & Trucker 1992 p. xiii).

### High Skill, High Performance, and High-Tech U.S. Workforce

While all learning may be important to some degree to help a society remain competitive, it is "high-skill" learning that many countries are now striving toward to increase their overall societal wage levels. Krogh and Roos (1996) have written that, "...as we move from the industrial age to the information age, knowledge is becoming increasingly critical for the competitive success of firms and the key to success in today's business is the application and development of specialized knowledge and competencies". The knowledge and skills required in the U.S. workforce has evolved over the last century. In reviewing labor's knowledge and skill migration within the U.S. workforce toward this more significant high-skill labor force Greenspan (2000) stated, "In 1900, only one out of every ten workers was in a professional, technical, or managerial occupation. By 1970, that proportion had doubled, and today those types of jobs account for nearly one-third of our workforce." One can only assume that this increasing demand for more skilled labor will continue to grow in the coming years.

How is this high-skill labor being leveraged in the new economy? High-skill labor is a necessary component to support achieving a "high-performance" workplace. In the U.S. the importance of attaining the skills needed to support a high performance work environment was underscored when in 1990, the U.S. Secretary of Labor appointed a commission to determine what skills our U.S. youth would need to be successful in the future world of work. The result was the

## Department of Labor's (DOL) Secretary's Commission on Achieving Necessary Skills (SCANS)

Report that confirmed the need for the U.S. to move towards a more high performance work environment to remain globally competitive. The high performance work setting is characterized by; a commitment to excellence; high product quality; and high levels of customer satisfaction. To achieve it means combining technology and people together in new ways pursues these goals. This commission's fundamental purpose became to encourage a high-performance U.S. economy characterized by high-skill, high-wage employment (DOL, 2000).

Technology plays an important role in this new high-skill/high-performance competitive workforce learning landscape. The SCANS Report (DOL 2000 p.4) states, "Above all these goals [achieving a high performance work setting] depend on ... responsible employees comfortable with technology and complex systems..." Clearly, our society is increasingly reliant on more advanced technology workforce capabilities. Gray and Herr (1998, p.85) write, "Most labor market experts agree that the most promising segment of the future workforce comprises technical workers."

## BACKGROUND

### Information Technology Workforce

An important subgroup of technical workers is our "information technology" (IT) workforce. For the purposes of this paper, information technology workers will be defined with the U.S. Department of Labor's Occupational Outlook Handbook category for "*Computer Systems Analysts, Engineers, and Scientists*." These workers—computer systems analysts, engineers, and scientists—include a wide range of computer-related occupations." (DOL, 2000-01). Computer technology is a continuously changing field and IT workers must continue to pursue lifelong professional education and training opportunities in order to stay current in their jobs. "Technological advances come so rapidly in the computer field that continuous study is necessary to keep skills up to date. These new jobs also will require workers with extensive educational backgrounds. The rapid spread of computers

and information technology has generated a need for highly trained workers to design and develop new hardware and software systems and to incorporate new technologies. (DOL, 2000-01).

### Central Interest / Question of Paper

Clearly it is now accepted that computer technology now plays both a ubiquitous and essential role in the continuing support of our U.S. economy. The IT workers that enable this IT technology are some of one of the most highly educated and trained professional workforces in the U.S. What is the are the education and development needs of this workforce to meet employer needs and what is the current state of our government policy that educates and develops this vital IT workforce?

## INFORMATION TECHNOLOGY WORKFORCE

### Information Technology Workforce Profile

“Information technology” (IT) refers to the collection of products and services that turn data into useful, meaningful, and assessable information (ITAA, 2002). Total employment in IT related jobs as defined as all employees in IT industries and all employees in IT related occupations in non-IT industries was about 7.4 million workers in 1996 (DOC, 1998). The IT workforce is not relegated to IT vendors alone but permeates all organizations across the U.S. Approximately two-thirds of IT jobs were directly within IT industries and the other one-third is spread across the rest of the economy (DOC, 1998). While not a very large workforce group in headcount per se, never the less IT workers make up an impressive amount of all U.S. wages. For example in 1996 IT workers represent 7.9% of all wages paid in the U.S. (DOC, 1998). IT workers are well compensated. On average IT workers typically earn more than twice the national average (DOC, 1997).

This paper focuses on one important subset of that entire IT workforce namely, *Computer Systems Analysts, Engineers, and Scientists*. Even within the high-skill IT industry as a whole, these particular roles are considered to be at the upper end of all “high-skill IT jobs”. Even in the IT workforce, like other workforces discussed, it is the high-skill IT jobs that countries are now aggressively pursuing. It seems that many “lesser-skilled IT jobs” are actually expected to decline in

number over the next few years, but that these higher-skill IT jobs are expected to grow dramatically (DOC, 1998). As computer applications continue to expand, these occupations are projected to be the fastest growing and rank among the top 20 in the number of new jobs created over the 1998-2008 period."(DOL, 2000-01). For example IT Computer Systems Analysts, Engineers, and Scientists jobs grew rapidly from an estimated 474,000 positions in 1990 up to 874,000 positions in 1996 (DOC, 1998). By 2006 BLS projects that 1.8 million people will be needed to fill these IT jobs (DOC, 1998).

#### Current ITWD Problem / Challenge

The U.S. is the world leader in information and communication technology products and services representing almost 35% of global spending on these products (ITAA, 2002). While the U.S. spending on information technology products is already quite large it is also increasing rapidly too. For example IT spending in the U.S. increased almost 70% from 1992, to almost \$762 billion in 1999 (Digital Planet/IDC, 1999 as cited in ITAA, 2002). Significant increases in the use of IT then in turn also require both maintaining the effectiveness of current IT employees and adding even more new IT employees to enable and support these newly acquired technologies. The U.S. Department of Commerce published Bureau of Labor Statistics projections on future U.S. demand for the occupational classifications of IT workers—computer scientists and engineers, systems analysts, and computer programmers clearly show that the U.S. economy will need a significant increase in these positions in the IT workforce. The continued health of IT is important to the U.S. economy in many ways. According to a U.S. Department of Commerce report the IT industry accounts for a full third of all real economic growth and half of the productivity growth between 1995 and 1999 (DOC, 1999).

Attempting to both keep the existing IT workforce viable and also to rapidly increase the total numbers of these workers, over a relatively short time frame, presents a fundamental U.S. public policy workforce development challenge at all levels of government. What kinds of U.S. public policy human capital inputs or investments have been undertaken to address this IT workforce supply and

demand mismatch? We will begin by first examining some of the ITWD related state public policy efforts across the U.S.

## STATE HIGH-TECH WDE PUBLIC POLICY EFFORTS

### State High-Tech WDE Background

In the U.S. it is the states, and not the federal government, that appear to be the best position to be the pivotal WDE public policy creators and implementers in the high-skill/high-tech new economy. Historically technology based economic development has been seen as the responsibility of the state and local governments with minimal involvement from the federal government (DOC, 2000). One component of state participation in technology based economic development is high-tech WDE. DOC reports (2000, p.4), "...state governments actively help new and growing technology companies to improve worker skills..." However, within states the opportunities for high-tech jobs are usually not uniformly spread across these states, but rather tend to accumulate in so called "regions" within states. While it may seem paradoxical regions, typically larger than cities but smaller than entire states, offer an important source of competitive advantage even as production and markets become increasingly global (Saxenian, 1994, p.161).

Until recently states enjoyed relatively strong geographic monopolies on their existing companies/jobs and workforces. However over the last few decades states have been watching the new global economy increasingly export jobs, whole companies, and in some cases whole industries, out of their states. It seems that states can no longer assume that the maintenance of jobs and job growth are solely the responsibility of employers and that this area has now become a major area of concern for state governments. States are now experimenting with variety of new public policies in order to better import and grow very desirable jobs like these high-tech jobs in the hopes of also gaining higher wages. For example the State of Florida actually created a number of WDE Regional "High Skills / High Wage Councils" across their state in part to encourage the development of more ITWD and other high-tech skills. There is a strong belief in the high-tech / high-wage success formula across the states

State Cycles of High-Tech Jobs and Increased Revenue

State governments' acute interest in more high-tech jobs and needed supporting WDE public policy is relatively straightforward. The vast majority of state revenues come, directly or indirectly, as a by-product of someone performing a job – preferably a high paying job. To illustrate this point let's examine Ohio as representative example of a typical U.S. state. The following data comes from Department of Commerce 1997 Census Data (DOC, 1997). In 1997 Ohio received only 20% of its income from the Federal Government. Ohio taxes made up 36% (the majority) of the state's revenue. Another 31% came from Insurance Trust Funds and 12% from other miscellaneous charges. Of Ohio's tax revenue 49% was sales tax, 37% personal income tax, 4% corporate tax, and 8% from licensing. When looking at Ohio's revenue contributions from corporations, personal income taxes, and sales taxes it seems clear that most of Ohio's revenues come as a by-product of jobs and the income they produce within the state. More numerous and better jobs, like high-tech jobs, result in higher state revenue. Conversely for the state, any loss of jobs may not only mean reductions of job related revenue but it can also result in increases state expenses like unemployment in the short term and public welfare expenses (second largest Ohio general expense at 26%) in the long term.

Ohio's primary means of ensuring the continuing supply of a viable skilled labor pool in the state is primarily through state supported education. In part, to support Ohio jobs, the largest category of Ohio's expenses is in fact substantial investments in the state's human capital. For example, in 1997 37% of Ohio state revenues went to education expenses in general. Of that in 1997 5.4 % went to higher education specifically.

Ohio, like most states, is attempting to create new state public policy with the goal of at least maintaining and hopefully improving the state's quantity of these high-tech jobs. For example in Ohio on February 5, 2002 Governor Bob Taft announced a major new plan to create more high-paying jobs by promoting start-up companies called the "Third Frontier". He said, "Our goals are simple: We'll

invest in our strengths, we'll build dynamic new businesses, and we'll create an explosion of high paying jobs in Ohio." (Taft, 2002).

Like Ohio, most states are now striving to develop new WDE public policies to better retain existing jobs and grow new jobs in high-tech industry sectors. Examples like Ohio's Third Frontier are ground breaking high-tech WDE related public policy efforts that are typical of many states public policy efforts in the U.S. However success in this state public policy area does not come easy. The previous widespread failure of science parks and other efforts by localities around the world to "grow the next Silicon Valley" underscores the limits of some approaches that focus solely on ensuring free flows of capital, labor, and technology needed for market adjustments." (Saxenian, 1994 p.166).

### States and High-tech Workforce Education History

As was discussed state's education systems are their primary public policy levers to support WDE. For the last hundred years states have relied primarily on K-12 and secondarily on their college/university systems. It is the states and not the federal government, through their state managed education public policy initiatives that have traditionally been the primary creators of a capable workforce to meet the labor skills needs of their respective state organizations. Marshall & Trucker 1992 p. 82 wrote, "Our constitution makes no mention of a federal role in education and the states have jealously guarded their right to make policy in this area." Most of these states education efforts over the last hundred years were to produce an appropriately educated workforce to meet the needs of employers in their respective states. At the turn of the 20<sup>th</sup> century American states built a mass production school model to fit the workforce needs of a smokestack economy (Marshall and Trucker, 1992 p. 13).

Through the development of their "mass production" K-12 education systems states were indeed relatively successful in building a capable workforce for the "old economy". But now that the new economy requires more high-skill/high-tech workers how are states reshaping their public policy

to develop these new workforces? In the case of this paper the question is narrowed to how are states developing ITWD specifically within their larger high-tech workforce?

## STATES ITWD PUBLIC POLICY EFFORTS

### Common State ITWD Public Policy Interests

While there is considerable state level diversity in ITWD related initiatives across the U.S. there are some associations like the National Governors Association (NGA) that can provide a "sense" of some of the more common/universal ITWD state policy issues. The NGA was founded in 1908 and was created to be the instrument through which the nation's governors collectively influence the development and implementation of national policy and apply creative leadership to state issues. Its members are the governors of the fifty states, three territories and two commonwealths.

In the case of ITWD for example, this year the NGA is hosting several major meetings across the U.S. to discuss, "State Leadership in the Global Economy" where they will be discussing the interaction of, "economic development, science & technology, and workforce development". More specifically these sessions will cover how states can leverage a new economic development theory from Harvard Business School's Michael Porter called "clusters of innovation". Porter is a researcher/authority on the foundations of economic competitiveness and the theory behind the success of regions such as Silicon Valley and Research Triangle Park, North Carolina. These so called clusters are concentrations of competing and cooperating companies, suppliers, service providers, and associated institutions. Clusters thrive in regions where industry, higher education and government work together to build intellectual capital, a highly skilled workforce, and supportive infrastructure.

IT clusters have been specifically identified as one type of cluster that the governors will be encouraged to pursue in each of their own states. In this case it seems that a number of states are attempting to determine the state public policy inputs and investments necessary to get more IT jobs and clusters are a promising new public policy theory (NGA, 2002).

So from the NGA it is clear that high-tech clusters in general and ITWD specifically is high on the states public policy debate agendas. However there are very few examples in the NGA's "Best Practices" area to suggest that many states have made substantive progress in achieving real improvements in their ITWD job gains.

### State ITWD Colleges/University Systems

The IT workforce job categories targeted in this paper generally prefer to hire workers with at least a bachelor's college degree (DOL, 2001). So over the last fifty years the primary ITWD system has been the state managed college/university systems. It seems that state level ITWD public policy inputs and investments were in effect generally synonymous within their overall state higher education public policies.

How effectively are state higher education ITWD systems functioning? Unfortunately over the last few years the state managed college/university system supporting ITWD has been inadequate to meet IT labor and skills demands. For example as cited above demand for these IT works grew rapidly from an estimated 474,000 positions in 1990 up to 874,000 positions in 1996 (DOC, 1998). However in contrast, engineering and computer science degrees peaked in the mid-1980s, quickly declined, and leveled off in the 1990s (NSF, 2002). When the incoming student demand for majors like computer science increased dramatically in a short period of time colleges/universities struggled to accommodate the fluctuating demand. To provide a sense of what new IT workforce output the state managed college/university ITWD system produces the computer science graduation rates during the 1980 and 1990s averaged around 28,000 new graduates per year (NSF, 2002) from about 1,000 schools offering computer science majors (CRA, 2002).

What are some of the underlying reasons for the states failure to produce enough computer science graduates? One reason is because state ITWD policy is virtually submerged within overall state managed higher education policy. In many cases from tuition costs to facility construction states tend to treat all of their programs uniformly. For example many states are mandating across the board cuts

in higher education without consideration of the specific workforces affected. In Ohio for example while demand for more IT graduates increased dramatically starting in the mid-1980s the State of Ohio's response was to substantially reduce their financial support for higher education. For example at Ohio State University, the premier state higher education institution, since 1987 the state's contribution to The Ohio State University's budget has fallen to 49% from 66% (Marrison, 2002). Another example is a headline from Computerworld's 02/01/99 issue reads, "High-tech students find classes full" (Cole-Gomolski, 1999). The article goes on to quote a Computing Research Association spokesperson that states, "Just about all of them [colleges] are having the same issues of overcrowding in computer majors." The article describes widespread college/university shortages in teaching assistants, classrooms, and labs while no additional funding from state legislatures is forthcoming. Other reasons for less IT graduates include that only about half of high school graduates complete Algebra II or Chemistry which are basic prerequisites for college math and science coursework; many students do not believe universities are properly training IT students for the actual marketplace needs; and many student see corporate cutbacks and really don't know what the actual demand for IT jobs is (DOC. 1997). So the states traditional education systems have not shown the capacity to respond to changing workforce needs like the IT workforce.

#### STATE ITWD PUBLIC POLICY EFFORTS EXAMPLES

To supplement their existing higher education systems states are now actively pursuing a wide variety of new ITWD public policies. Some are significant while others still relatively trivial. For example, in Connecticut the state formed the Connecticut (IT) Technology Council that has compiled a searchable database of technology companies with a presence in Connecticut. "The database will assist study of the technology sector in Connecticut and puts a face on the most dynamic engine of economic growth in Connecticut." Clearly Connecticut's ITWD efforts are still relatively modest (CERC, 2002).

While not attempting to be comprehensive, three distinctly different and significant state ITWD approaches have been selected and will be discussed in some detail. In the case of Pennsylvania the

state is taking a more traditional ITWD approach and focusing on specifically improving ITWD within their existing state managed education system. In the case of Arizona the state was first to implement the “cluster” as the new vehicle to support improved ITWD. Finally in the case of Ohio the state has divided up the state’s major cities into groups in an attempt to encourage groups of cities to join in cooperative ITWD efforts.

#### Pennsylvania ITWD Case Example (Link to Learn, 2002)

Pennsylvania (PA) has focused on improving the state’s traditional ITWD vehicle - their existing education ITWD system - to improve the capabilities of the state’s IT workforce. In PA, ITWD is a competitive funding initiative designed to enable higher education institutions to attract, retain and graduate information technology students with the knowledge and skills that match the needs of PA employers. Twenty-six higher education institutions received funds through this program. These funds directly serve more than 8,400 prospective and current IT students, more than 250 higher education faculty, and 2,600 PA K-12 students and teachers. The list of partners includes 87 businesses, 54 educational institutions, and 9 government and non-profit organizations.” Because of this commitment, PA has entered into partnerships with several technology industry leaders to provide resources and training to prepare PA for the 21<sup>st</sup> century. A related state effort is Governor Schweiker’s \$132 million “Link-to-Learn Workforce and Economic initiative”. PA is preparing students for a high-tech global economy. Link-to-Learn is attempting to be a catalyst for the effective use of information technology to enhance education, promote community partnerships, and support economic growth in a knowledge-based society.

#### Arizona ITWD Case Example

One of the things that make Arizona (AZ) ITWD efforts interesting are that back in 1992 the state attempted to achieve an advantage by becoming an early adopter of (the now fashionable) industrial clusters as one of its key economic development strategies. AZ has defined its clusters as regional concentrations of companies, suppliers, institutions and foundations within a business sector

that leverage their competitive advantages and limited resources to more effectively collaborate, cooperate, partner and compete. In AZ high-tech clusters are those that leverage their competitive advantages and limited resources within a technology as opposed to business sector. The high-tech clusters operating in AZ are: Bio-Industry, Environmental Technology, High Technology, Industry/Aerospace, Optics, Plastics/Advanced Composites and Software/Information.

AZ believes that the companies comprising the high-tech industry clusters are important because they are: 1) export oriented (bring in new dollars); 2) high-paying (salaries are 50% or greater than the average private-sector wage); 3) high-growth (5 to 15% or more annually); and 4) environmentally sensitive (nonpolluting). In mid CY 2000, AZ's State Legislature had the foresight to appropriate \$100,000 for high-tech industry cluster development. Its appropriation was followed by the Arizona Department of Commerce making several times that amount of money available for high-tech industry cluster development via the Commerce & Economic Development Commission.

#### Ohio ITWD Case Example (OIAP, 2002)

Within the State of Ohio, the Ohio Department of Development works collaboratively with businesses, communities and the Ohio Legislature to develop financial and technical programs that contribute to the state's reputation as one of the best places in the world to live and do business. The Department of Development is responsible for "Ohio's IT Alliance Program" (OIAP). Ohio's OIAP is a dedicated state resource to ITWD whose stated top priorities in every region of the network are (IT) workforce development and ensuring that Ohio has a technically competent IT workforce. OIAP is an Edison Technology Center, supported and funded by the Ohio's Department of Development's Thomas Edison Program and chartered by the Governor of Ohio. OIAP a statewide network of six regional organizations with one common goal: growing and improving the competitiveness of Ohio's information technology (IT) industry. These six groups – located in Athens, Cincinnati, Cleveland, Columbus, Dayton and Toledo – serve as focal points for their region's IT activities and create the structure for defining and developing programming necessary to retain and grow the industry across

the state. Together with over 1,200 members, OIAP works with 9,200 IT companies to ensure that Ohio's IT resources are shared, leveraged and optimized for the benefit of the entire industry.

Each of these three states seems to be taking different public policy approaches to ITWD. PA is clearly attempting to enhance the ITWD capabilities of their existing educational institutions. Arizona is attempting to foster a new economic development model of encouraging "IT clusters" as an ITWD enabler. Finally, Ohio is focused on encouraging regional ITWD coordination. While many of these initiatives are relatively new there seems to be little evidence that these ITWD efforts are making any headway. While the states seem to be very motivated to improve their ITWD it is not clear that they actually know what new policies might achieve those goals. In some cases it seems like states are starting one imitative after another without regard for previous efforts in the hope that one will "catch on". For example in Ohio OIAP, Third Frontier, Board of Regents and other WDE related institutions are not connected and not coordinated.

#### CITY ITWD POLICY EFFORTS INTRODUCTION

##### City ITWD Introduction

Cities have considerably less public policy options to affect their ITWD as compared with states. City efforts are probably most effective when they are a part of state and/or federal programs. Two cities have been selected as examples. The first city of Buffalo NY was selected because it appears to be a totally "free-standing" city ITWD effort. The second Dayton, OH was selected because its program is a part of a larger OIAP state program discussed above.

##### Common City ITWD Policy Interests (USCM, 2002)

There is also considerable diversity in ITWD related initiatives across the cities within the U.S. but there are some associations like the U.S. Conference of Mayors (USCM) that can provide one a "sense" of some of the more common/universal city policy issues. The USCM is a large nonpartisan organization of cities with populations of 30,000 or more. There are 1,139 such cities in the country

today. Its chief elected official, the mayor, represents each city in the Conference. Of note is that in 2001 USCM hosted four “Skills Summits” to the needs of labor market and skills gaps (USCM, 2002).

One example from USCM and ITWD comes from USCM’s best practice database that includes this “Ft. Worth Works” example of ITWD related efforts in Ft. Worth Texas. Over the last few years, Ft. Worth has worked hard to attract thousands of high tech jobs – jobs that pay good wages and have good fringe benefits,” says Ft. Worth Mayor Kenneth Barr. “Until we created Fort Worth Works, we had no effective way of linking the new jobs with our citizens. Thanks to Fort Worth Works, our citizens are successfully landing the outstanding jobs that are coming to Fort Worth, and our employers are finding the skilled and/or highly trainable workers they need.”

Another ITWD related example was the following. In July, 2001 Marc Morial the USMC President launched a tour of cities to promote in part that cities were ready to assume a leadership position in the nation’s future. As part of the six new principles for redevelopment of American cities he called for increased investment in “information-based economy”. He also specifically stated if cities were to remain competitive they must diversify their economies and focus on information technology, biotechnology, and medical research.

#### CITY ITWD PUBLIC POLICY EFFORTS EXAMPLES

##### Buffalo, New York ITWD Case Example (BERC, 2002)

In November 1999, Mayor Anthony M. Masiello launched the “Buffalo Byte Belt Technology Development Initiative”, an eight-point plan to foster the burgeoning IT industry in Downtown Buffalo. Point seven of the plan is the development of an “IT Training Initiative”. Believing that Buffalo’s workforce must be matched to the emerging economy of tomorrow, they will work with local training providers and institutions of higher education to develop IT industry specific training programs and research related initiatives. The initiative has the support of the Mayor’s “Information Technology Council” to make this a city priority.

A major component of the Buffalo Byte Belt was the formation of the Mayor's IT Council comprised of the visionaries and leaders of Buffalo's IT industry. About 1997, Buffalo started to witness growth in their information technology sector. They seized the opportunity as a galvanizing force and coordinated a number of incentives, packaged and presented as the Buffalo Byte Belt Technology Development Initiative. The City of Buffalo realizes that their future is predicated, in part, by their ability to use emerging technologies as catalysts for economic growth. Much to their surprise, Downtown Buffalo actually has an appeal for IT businesses. Over the last two years, many IT businesses have opened their doors or expanded in the Buffalo Byte Belt. These companies include: E-Merge Strategies, Digicon Imaging, Full Circle Studios, Algonquin Studios, Key Video Productions, Tek 21, Ivergent and M Power Specialists.

There has also been tremendous growth in their existing IT companies. Chek.com went from 3 to 107 employees in a mere two years and Choice One Online, Reciprocal and Syrinex Communications have all substantially expanded. Since November 1999, 536 new jobs have been created in Buffalo's IT sector. The biggest coup was Adelphia Communications' decision to build their national operations center on the city's waterfront, creating 1,500 jobs. The City of Buffalo's data confirms that there are currently 35 IT businesses employing 3,000 people in Downtown Buffalo.

#### Dayton, Ohio ITWD Case Example (GDITA, 2002)

The Dayton Area Chamber of Commerce implemented its Community Sponsorship Program in November of 1997. Due to a labor shortage, workforce development became the #1 economic development priority for their region. Unemployment at the time was around 4.2% and it has continued to drop to around 3.8%. There were two unique challenges for their area; they have zero population growth; they had a lot of high-tech companies, manufacturers serving the auto industry, and an air force base and they had a significant need for highly specialized workers like computer science professionals, mechanical engineers, and software engineers.

In response to the IT workforce need four counties around Dayton formed the Dayton Regional Development Alliance. The Alliance is comprised of a full time staff of economic development professionals. Dayton believed that the burgeoning demand for information technology (IT) workers is causing heartache for recruiters and creating fierce competition between companies to attract and retain IT talent. Unfortunately their Midwest location and lack of national recognition exacerbate the challenge for the Dayton region. Recruiting from outside the region is difficult and fast-growing IT companies risk raiding each other's staffs in the scramble for talent. The region's diverse IT interests adopted a strategy of "growing their own," making them less reliant on outside recruitment and less likely to "cannibalize" neighboring companies. Corporate, academic and government leadership have come together to form joint workforce development initiatives. Local universities and community colleges are working with the IT community to create specialized curricula and training facilities. Dayton's IT sector encompasses an array of specialty niches such as avionics software, secure systems, and software development for the ATM, machining, composites and automotive industries. And its demand for knowledge workers is tremendous. The region also hosts IT industry giants LEXIS-NEXIS, NCR, Standard Register and automotive and business software specialist Reynolds & Reynolds. In total, the Dayton area IT industry employs an estimated 21,000 people, with anticipated expansion to 27,000 by the year 2003.

#### NATIONAL ITWD PUBLIC POLICY EFFORTS

##### National ITWD Introduction

The fundamental federal role in ITWD has been twofold. First of all to monitor and report on U.S. IT workforce needs overall. Secondly, to facilitate the states in dealing with their individual IT workforce needs. In the case of the American Competitiveness and Workforce Improvement Act the federal government with its responsibility for immigration is essentially helping states to buy/import IT workforce capacity overseas to augment their existing workforces. In the case of the Workforce Investment Act the federal government is "pushing out" the WDE responsibilities to the states and

cities to take the actions they deem appropriate to meet their “local” needs while studying the status of ITWD needs across the country specifically.

#### U.S. National ITWD Policies and Peer Government ITWD Policies

While it is not the mission of this paper to discuss ITWD government policies in other countries, it is worth briefly noting a sense of the corresponding national ITWD interests that some other peer/competitor nations are now pursuing. Button, Cox et al (2000, p.1) write, “Concern to enhance the information technology skills base is not just a U.S. phenomenon. In every nation that is experiencing the transforming effects of digital technology, there is an avowed shortage of worker skills in designing, building, and maintaining the technology infrastructure. That shortage is most pronounced in the Western European and Asian markets that have embraced technology.”

In our class it has been discussed many times that the U.S. does not have a strong national workforce development system. Conversely, it should not come as a surprise that these other competitor nations to the U.S. that have more centralized education systems and more centrally coordinated training institutions than the U.S. and they are aggressively pursuing national ITWD policies in an attempt to gain national competitive advantage in IT (Button, Cox et al, 2000). So what ITWD national public policy human capital inputs and investments is the U.S. at the federal level pursuing?

#### **NATIONAL ITWD PUBLIC POLICY EXAMPLES**

##### American Competitiveness and Workforce Improvement Act (1998 & 2000)

One of the most dramatic and direct national ITWD initiatives was the enacting of the American Competitiveness and Workforce Improvement Act (ACWIA) in 1998. In enacting ACWIA, Congress gave the benefit of a doubt to the widespread belief that the United States is facing a severe shortage of workers who are qualified to perform skilled information technology jobs, although it recognized that evidence of a shortage is inconclusive. The Act increases H-1B visa quotas from 1999 through 2002 leveling off in following years. The H-1B is a nonimmigrant classification used by an

alien who will be employed temporarily in a specialty occupation or as a fashion model of distinguished merit and ability.

Funding for education programs funded through the H-1B Petitioner Account established by Title IV of the ACWIA of 1998 (P.L. 105-277). These activities include the Computer Science, Engineering, and Mathematics (CSEM) Scholarships. Under this program, eligible low-income individuals pursuing associate, undergraduate, or graduate degrees in the disciplines specified provide merit-based scholarships of up to \$2,500 for new or continued enrollment at institutions of higher education.

A revision of the 1998 law continues to acknowledge foreign workers' important role in driving the United States' economy. In addition, it creates special funding, grants for non-profit organizations, and calls for studies of the "Digital Divide" which may become a factor that could slow down the U.S. economy. This ACWIA update increased in the H-1B cap for the three fiscal years: H-1B visas are increased to 195,000 for fiscal years 2001, 2002, and 2003. The dramatic increase in the H-1B numbers was caused by substantial pressure especially from the high-tech industry lobby. Congress simultaneously passed another law that the President also signed, which authorizes the current H-1B filing fee of \$500.00 to be increased to \$1,000.00 effective December 17, 2000. This filing fee is in addition to the \$110.00 base fee for H-1B applications.

The increase in both H-1B fees combined with increased numbers of H-1B applicants funds a DOL Employment and Training Administration's, America Workforce Network, "High-Tech Skills Training" Program. The funds are allocated to the National Science Foundation (\$69 million) math and science education programs for low-income students. Additional grants have been awarded to train laid-off workers in computer and information technology skills and to help employers meet identified skills shortages.

The ACWIA is interesting from a number of different workforce development perspectives. First of all in some ways ACWIA seems to represent classic labor market master planning. The U.S. IT

workforce levels are being monitored and future U.S. economy needs planned out. The federal government is using legislation and legislation updates to actively adjust the influx of additional IT workforce members. At the same time participating employers are paying labor “premiums” to fund new U.S. ITWD. ACWIA would also seem to be a very targeted “vertical” high-skill labor market adjustment compared with other workforce development initiatives that targeted larger, less-bounded, “horizontal” groups like the disadvantaged or displaced general worker. Perhaps the ACWIA workforce development targets have set a new U.S. workforce development public policy precedent that is significant?

#### Workforce Investment Act (USWorkforce.Org, 2002)

Perhaps the most significant workforce development initiative to come from public policy in the last few years has been the Workforce Investment Act (WIA). WIA was signed into public law in August of 1998. The Department of Labor worked with Congress to create the new WIA and it was signed into law after five years of active deliberation. WIA was intended to represent an overhaul of our country’s job-training system, as a customer-driven redesign that will help employers get the workers they need and empower job seekers to meet the challenges of the new century by getting the training they need for the jobs they want. A summary of the workforce development provisions of the act include; Title I that authorizes the new Workforce Investment System; Title II that reauthorizes Adult Education and Literacy Programs; Title III that contains amendments to the Wagner-Peyser Act, provides for linkages with other programs, and authorizes the Twenty-First Century Workforce Commission; Title IV that contains amendments to the Rehabilitation Act and finally Title V that contains General Provisions relating to the Act.

How does the WIA relate to ITWD specifically? Within the WIA the explicit establishment of the 21<sup>st</sup> Century Workforce Commission would seem to demonstrate a new and expanded level of national public policy interest in ITWD. The previous Job Training Partnership Act did not include any similar provision. “The 21<sup>st</sup> Century Workforce Commission is an independent commission, appointed

by the President and Congress. The Commission is charged with examining and reporting to the President, the Congress and the Nation, what are the knowledge and skills that individuals must possess, and what educational and workforce development opportunities must be available, to allow the greatest number of Americans to successfully participate in the 21<sup>st</sup> Century Information and Technology Workforce. The Commission is gathering information about: knowledge and skills necessary for IT employment; strategies for expanding the number of individuals with IT skills; and best practices and policies in the U.S. and abroad related to IT.

#### FINAL THOUGHTS AND CONCLUSIONS

##### Public Policy Debate of ITWD

My overall impression of the current state of ITWD and related public policy is that there are currently many more policy discussions and tentative efforts occurring than substantive human capital inputs and investments being made in ITWD at this time. However extensive and thoughtful ITWD related public policy discussions/debates appears to be occurring at every level of the government from small cities to, counties, to states, to major federal departments.

What seems clear from the student's research review is that the U.S. is experiencing two major issues related to ITWD. First it appears that there is a shortage of IT workers to which the government at all levels has reacted, but most of the tangible response has been to "import IT workforce capacity" via the H1-B Visa Program at the federal level. In fact I have found evidence that at all levels of our government from cities like Austin, Texas to states like Virginia, to the federal government's H-1B Visa Program - that largest and most focused ITWD efforts are currently centered around "raiding and capturing" IT workforce professionals from other geographies existing IT labor pools. Whether this serious IT labor shortage is a temporary labor supply and demand aberration or long-term, systemic U.S. workforce development challenge remains to be seen.

The second most pervasive public policy trend I have noted is an significant overall concern, at all levels of government, about what is commonly referred to as the needed skill composition of the

“21<sup>st</sup> Century Workforce in the U.S.” For example on March 6, 2001, Labor Secretary Elaine L. Chao announced the creation of a new Office of the 21<sup>st</sup> Century Workforce in her first major policy address at the Department of Labor. There seems to be significant momentum at all levels of public policy to more clearly define and actively pursue “high-skills” jobs in the U.S. Clearly the IT workforce will be a part of that high-skill workforce develop undertaking.

Unfortunately there still remains a paucity of clear ITWD public policy successes at any level of government. “Buying” someone else’s already educated and developed IT workforce remains our most successful effort so far.

#### Future Interests in ITWD

I have come to believe that ITWD could become a “showcase” WDE public policy area. There is acute government ITWD interest and motivation and few clear policy answers. It is a vital part of our economic success and ITWD has interesting synergies when combined with other public policy levers to further economic development. It is a high-knowledge/high-prestige job area and could help reduce the vocational and disenfranchised baggage that WDE now seems to carry.

ITWD also has a number of interesting and yet unexplored other facets. For example: If virtually all workers use IT then can the lessons learned from ITWD be leveraged with all workers? Since IT programming can be performed from anywhere is it not an outstanding candidate for handicapped workers? What can be done to improve the percentage of women in IT? Since full degrees are not always needed “second chance” workers could potentially more quickly (shorter education periods) enter the workplace at higher income levels?

Finally ITWD could be the “poster child” for states to show the needs and benefits of reengineer their higher education systems. ITWD requires lifetime learning and not “one-shot” four-year programs. Meeting the needs of ITWD could be a catalyst for states to reevaluate their higher education public policy and systems.

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